Treatment of Severe Hidradenitis Suppurativa of the Axilla: Thoracodorsal Artery Perforator (TDAP) Flap versus Split Skin Graft

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Running Head

TDAP flap versus SSG for axillary Hidradenitis Suppurativa

Category

Original Research Article

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Abstract

Background

Hidradenitis suppurativa (HS) is a chronic, inflammatory disease affecting the apocrine glands of the axillary, groin and mammary regions with significant physical and psychosocial sequelae. Surgical excision of the affected tissue is the gold standard treatment. Extensive severe axillary HS is associated with high rates of recurrence and requires large surgical resection with challenging reconstruction with high risk of post-operative complications. The most effective method for reconstruction of the axilla is yet to be identified. We present a prospective observational study comparing thoracodorsal artery perforator (TDAP) flap and split-skin graft (SSG).

Methods

Over 4 years, we enrolled 27 consecutive patients with Hurley's Stage III HS of the axilla who underwent surgical excision with reconstruction using either SSG (n=12) or TDAP flap reconstruction (n=15). We evaluated and compared intraoperative and postoperative data, quality of life (Dermatology Life Quality Index questionnaire) and pain/discomfort (visual analogue scale) before and after surgery.

Results

Patients who underwent TDAP flap reconstruction had significantly faster recovery, fewer complications and fewer overall number of procedures than those who underwent SSG reconstruction. All patients reported an improved quality of life (QOL) after their operation, although the TDAP group showed significantly more improvement than the SSG group. All patients reported a reduction in pain/ discomfort but there was no significant difference between groups.

Conclusion

TDAP flap and SSG both improve QOL for patients with severe axillary HS. The TDAP flap showed greater benefits in terms of QOL, recovery, rate of complications and number of overall procedures.

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Keywords:

Hidradenitis suppurativa; Reconstruction; TDAP flap; Skin graft; SSG; Reconstruction of the axilla; Quality of life.

Introduction

Hidradenitis suppurativa (HS), also known as acne ectopica or acne inversa, is a chronic, suppurative inflammatory disease affecting the axillary, groin and mammary regions.^{1,2} It has an estimated prevalence of 1%. It is characterized by the presence of recurrent inflammatory follicular nodules, papules, pustules and painful abscesses with malodorous discharge leading to considerable physical and psychological effects on the patient.³⁻⁷ Several aetiological factors have been suggested, with axillary involvement more common in women and some evidence that both smoking and obesity contribute to its pathogenesis; these factors do not seem to affect progression of disease.⁸⁻¹² The treatment of HS can broadly be divided into medical and surgical. Medical treatments include both topical and systemic therapies, including antibiotic, steroid and biological therapies.¹⁻⁴ However many of these interventions have significant side effects and are associated with a high rate of recurrence of disease.^{7,13} Surgical excision of the affected skin tissue with adequate free margins is the gold standard treatment for prevention of recurrence. Indeed, radical surgical excision appears to be the most effective treatment of the disease in terms of patient-related and disease-related outcomes.¹⁴⁻¹⁷ In mild or moderate disease and when feasible, the defect following surgical excision can be managed with primary closure.^{15,26}

The most challenging subset of patients with HS are those who have extensive, severe, recurrent disease. These patients often undergo prolonged courses of medical therapy before undergoing numerous surgical interventions. The evidence base for surgical interventions for extensive, severe HS is limited but the available data suggest that these patients often incur longer hospital stays and a higher rates of revisions.^{8,10} Similarly, higher rates of post-operative morbidity, secondary scar contractures, shoulder stiffness with objectively reduced range of movement and prolonged recovery time have also been reported in this group.¹⁷ Historically, extensive severe HS is treated with excision of the affected tissue and the surgical defect either left to heal by secondary intention or grafted with a split thickness skin graft (SSG).¹⁰ However, more recently local, regional and free flaps, such as the fasciocutaneous V-Y flap, Limberg flap and musculocutaneous flap, have been used for the reconstruction of the axilla after excision of HS. In particular, perforator flaps, such as the thoraco-dorsal artery perforator (TDAP) flap, have been reported as advantageous for the reconstruction of the soft-tissue defect following excision of severe extensive axillary HS.^{3,10,17}

It is yet unknown whether the type of surgical procedure has an impact on the patient's quality of life. There has also not yet been a direct comparison between two surgical reconstructive procedures for the treatment of HS. We present a preliminary report of a prospective study comparing the use of the TDAP flap and the SSG for the reconstruction of the axilla following excision of extensive or recurrent axillary HS, with focus on both operative and patient-related outcomes.

Patients and Methods

We conducted a prospective study of all consecutive patients undergoing surgical treatment for axillary HS at the Department of Plastic and Reconstructive Surgery of the Norfolk and Norwich University Hospital from September 2008 to September 2012. Demographic data were extracted on age, sex, comorbidity, smoking, obesity, duration of the disease, drug history and previous HS treatment (medical and surgical) (Table 1). Severity of disease was classified using the Hurley's classification (Table 2).²⁶ Patients who were eligible for primary closure of the defect after surgical excision of the axilla were excluded from this study (Hurley's stage I and II). The disease-free surgical margins were determined as 2 cm.^{3,8,10,14,16} Those patients with Hurley's stage III with extensive disease or recurrent disease were divided into two groups defined by their treatment: TDAP reconstruction and SSG reconstruction. All TDAP flaps were based on a single perforator and inset as propeller-like flaps into the surgical axillary defect (Figure 1). All of the SSG were meshed using a ratio of 1:1.5 (Figure 2). Operative variables that were measured include: operating time, hospital stay, complications, recurrence of disease, total number of surgical procedures, follow-up and return to preoperative activity (Table 3). Delayed wound healing was defined as a wound healing process longer than 4 weeks. Patients were not randomized to their treatment.

The Dermatology Life Quality Index (DLQI) questionnaire and a visual analogue scale for pain and discomfort were completed by patients before surgery and at 12 months post-operatively to determine effect of the surgical treatment on quality of life.¹⁸⁻²¹ The DLQI generates a score between 0-30 with a higher score indicating a worse quality of life (Table 4). The DLQI scores are further classified as follows relating to the effect on the patient's life: 0-1 = disease has no effect, 2-5 disease has limited effect, 6-10 = disease has a moderate effect, 11-20 = disease has a significant effect, 21-30 = disease has a very significant effect. The VAS score assesses discomfort and pain across a continuum of values between each end of a line, from no discomfort/pain to worst possible discomfort/pain: the patient records their subjective assessment of their

current state on the scale. The DQLI questionnaire and the VAS scale have been already extensively adopted in the assessment of HS and represent a routine assessment practice in our department. Analyses of continuous variables were measured using the Student's T-test where appropriate. Analyses of categorical variables were measured using the Chi-square test. Significance was set as $p \leq 0.05$.

At our centre, all the described methodologies are used in standard practice; therefore, we felt that it was important to measure outcomes for each, to establish standards against which we could audit in the future. For this reason, we considered this project to be the first part of the audit cycle. This was discussed in detail with the local Research and Ethics Committee who concurred with our views and confirmed no need for this research to be reviewed within the National Health Research and Ethics Committee system.

Results

In total, 44 patients were operated on during the study period. Seventeen patients were classified as Hurley's stage I or II and were treated with excision and direct closure: they were therefore excluded from the study. Twenty-seven patients were classified as Hurley's stage III and were included in the study. All patients were operated on under general anaesthesia, in supine or lateral position and all received a post-operative antibiotic course and routine venous thromboembolism prophylaxis. During the immediate post-operative period both groups received in-hospital physiotherapy prior to discharge. Follow-up evaluation was conducted at 3, 6 and 12 months after surgery.

The TDAP group and the SSG group were largely comparable in terms of patient demographics, although there was a larger proportion of smokers and those that had already undergone excision and primary closure in the TDAP group (Table 1).

Operative variables are summarised in Table 3. There was a statistically significant difference in the number of surgical procedures between the two groups, with the SSG group undergoing more surgical procedures than the TDAP group (mean 2.1 versus 1.2, $p=0.01$). The mean operating time was also significantly longer in the TDAP group: 196 minutes (range 130-360 min) for the TDAP group and 80 minutes (range 50-120 min) for SSG group ($p \leq 0.005$). The mean hospital stay was 4.7 days for TDAP flap and 6.7 days for SSG. There was a significant difference in the mean recovery time, defined as a full return to pre-operative activity,

between the two groups whereby recovery was 5.4 weeks for TDAP group and 16.1 weeks for SSG group ($p=0.03$). The SSG group had an average of 4 (range 2-7) follow-up clinic appointments for dressing and wound review. The TDAP flap group had an average of 1 (range 0-2) follow-up clinic appointment. The TDAP group therefore had a shorter length of follow-up compared to the SSG group.

The TDAP group had significantly fewer complications than the SSG group ($p<0.005$). Complications were reported as follows. There were five cases of delayed wound healing at the recipient site (axilla) in the SSG group secondary due to partial graft failure (25-65% graft loss). There was one case of delayed wound healing at the donor site in the SSG group. Three patients who underwent SSG reconstruction developed restricted range of movement of the shoulder secondary to contraction of the graft and subsequently underwent prolonged physiotherapy before discharge. No partial or total TDAP flap failure occurred and all patients reconstructed with TDAP flap reported a fully satisfactory outcome. Two TDAP flap patients required revision procedures: one patient required debulking of the TDAP flap and another underwent axillary scar revision. No patients who underwent TDAP flap reconstruction developed post-operative restriction range of movement of the shoulder. One patient with a TDAP flap reconstruction was readmitted to the ward 4 weeks postoperatively due to donor site wound dehiscence and secondary cellulitis. This was treated initially with intravenous antibiotics, based on the microbiology swabs cultures although subsequently required a return to theatre for washout and wound closure. During the follow up period, one recurrence was reported in the SSG group. One patient with TDAP flap presented 23 months after surgery with a new lesion in the surrounding skin over 3cm inferiorly to the lower border of the flap in the right axilla. No further surgery was planned at this time.

DLQI and VAS results showed improvement in patients' quality of life across both groups (Tables 4 and 5). One patient in the TDAP group did not respond with DLQI or VAS scores. Baseline DQLI scores ranged from 21-31 for all the 27 patients (extremely significant impact on patient's quality of life). In the TDAP group, five patients reported improvements to a 'moderate effect on QOL' (6-10) and nine patients reported improvements to a 'small effect on QOL' (2-5). For the SSG group, one patient reported a 'very large effect on QOL' (11-20), ten patients reported a 'moderate effect on QOL' (6-10) and one patient reported a 'small effect on QOL' (2-5). The mean VAS scores were reduced by 5 points for the TDAP reconstruction group and by 3.92 in the SSG group. The TDAP group showed significantly better improvements in quality of life

compared to those who underwent SSG, with a mean reduction in DQLI of 23.1 points compared to 19.3 points ($p=0.02$).

Discussion

There is an ever increasing body of knowledge surrounding hidradenitis suppurativa and its management, although many unanswered questions and the 'gold standard' management of severe axillary HS has yet to be identified.^{1,2,29} There is increasing evidence that surgical excision with reconstruction may be the most effective treatment for the extensive, severe axillary involvement in terms of operative and patient-related outcomes and our study provides the first direct comparison of split-skin graft versus the TDAP flap for the reconstruction of the axilla following extensive axillary resection for HS.^{3,4,7,10} Although excision and split-skin grafting can produce satisfactory results in patients with mild to moderate disease, its use in more severe disease can predispose to graft contraction, reduced range of movement of the shoulder, poor scarring, prolonged recovery and an increased number of surgical procedures.^{4,8,10,27} Excision and TDAP flap reconstruction is an emerging technique that provides adequate coverage of the defect, such that many of the complications of SSG reconstruction are avoided and although the operating time is longer, the literature and our results suggest that patients experience a quicker recovery, fewer complications and a lower incidence of restricted range of movement of the shoulder (Figures 3 and 4).^{3,17,28}

The main aim of our study was to compare the SSG and TDAP techniques for the management of extensive axillary hidradenitis suppurativa in terms of operative and psychosocial outcomes at our centre over 4 years. This is a preliminary report of our prospective series of patients recruited at one centre. We evaluated 27 patients with Hurley's Stage III hidradenitis suppurativa of the axilla who underwent excision and reconstruction with either the TDAP flap or a SSG. The majority of patients being female and obese, which corresponds to the current understanding of this patient group demographic.⁸⁻¹² There were a higher number of smokers in the TDAP group, but this did not appear to influence results despite the negative implications of smoking in both HS and reconstructive surgery.¹² Comorbidities were similar across groups. The TDAP group included 6 patients who had previously undergone excisions with primary closure. This can be explained by the chronicity of HS and the clinical trajectory that these patients usually follow, ultimately necessitating several operative interventions over the natural progression of their disease. The TDAP is usually the definitive option once more conservative procedures have been attempted.

There was a significant difference in operating time which appeared to be considerably longer in the TDAP group; a finding that is supported already in the literature.^{3,17,29} The 2 days decrease in hospital stay in the TDAP group did not reach statistical significance and this may be explained by the fact that the study was not sufficiently powered to detect this difference. However, a 2 days reduction in hospital stay is an interesting finding to be considered and may warrant further investigation. Our study also demonstrates significant reductions in recovery time ($p=0.03$) for patients who underwent the TDAP flap. The TDAP cohort had a higher rate of revision surgery (2 versus 0) compared to the SSG group, which may reflect the difference in management of complications between the two groups (TDAP flap: further surgery, SSG: conservative). The SSG group required a greater number of follow-up appointments in clinic than the TDAP flap group, although this did not reach statistical significance. This is likely due to the complications associated with this technique, most notably partial graft failure requiring regular review. The TDAP flap may provide a more definitive surgical solution compared to the SSG technique, requiring fewer clinic appointments, a shorter period of follow-up and thus is potentially more cost-effective, despite the longer operative time.

As well as improvements in surgical outcomes, the TDAP group also displayed a significantly improved quality of life after their operation compared to the SSG group, as indicated by the DLQI scores. There were no significant differences in pain or discomfort, measured by the VAS scores, between the two groups, although all patients reported an improvement in this outcome. This finding adds to the potential benefit of the TDAP flap in terms of comparable post-operative pain. Our findings certainly warrant further investigation of quality of life as an important outcome when evaluating surgical management of HS.

Our sample size may have been insufficiently powered to detect other potential differences between our two study groups. Although HS is not necessarily a rare disease, the prospective recruitment of patients into our series is challenging, which is most probably due to the undefined and convoluted referral patterns these patients are often subject to. Only patients with severe, unrelenting disease are usually referred to our Plastic Surgery Department, having undergone treatment for many years previously under the care of physicians or other surgical specialties, sometimes carrying the wrong diagnosis. A multi-centre, multi-speciality prospective database of patients with hidradenitis suppurativa may be the useful way of bypassing these recruitment issues.

Conclusion

The results of our series advocate the use of TDAP flap for post-excision reconstruction of severe axillary hidradenitis suppurativa over the SSG technique. Of course, further investigation into the ideal surgical procedure for severe HS with randomized trials is needed before definitive recommendations can be proposed. However, based on our results and the available literature, we propose the use of TDAP flap as an ideal option in the treatment of extensive axillary HS as it improves recovery time, has fewer post-operative complications and conveys a better post-operative quality of life for this selected patient group.

Words count: 2,586

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Figure Captions

Figure 1

TDAP flap reconstruction after excision of axillary tissue affected by severe, extensive HS:

- A. Thoracodorsal perforator artery flap dissected
- B. Pedicle (thoracodorsal vessels) illustrated supplying flap
- C. Flap is mobilised in propeller-like fashion into defect
- D. Immediate post-operative result

Figure 2

- A. Extensive hydradenitis suppurativa involving the right axilla
- B. Three week post-operative result with a split-skin graft. The patient suffered 25% partial loss of the graft.

Figure 3

- A – D. Affected axillary skin pre-operatively.
- E – H. Post-operative result following reconstruction of the axilla with a TDAP flap.

Figure 4

- A – C. Affected axillary tissue and pre-operative planning for excision and TDAP flap reconstruction.
- D – F. Post-operative result following excision and TDAP flap axillary reconstruction.